Drag Chain Conveyor Having Plastic Carriers

Description

The invention relates to a drag chain conveyor for use in underground mining, especially in hard or bituminous coal mining, comprising interconnected, profiled conveyor chutes and conveyor chains, of metallic material, guided therein, with plastic carriers attached to the chains, as well as with at least one drive for the conveyor chains.

A drag chain conveyor having the aforementioned features is described in WO 01/81211 A1. Pursuant to one embodiment thereof, at least the carriers are comprised at least partially of a self-distinguishing, difficult to ignite plastic having a high mechanical strength, without any details being provided as to how the conveyor chains, with the carriers connected thereto, should be embodied. It is therefore an object of the present invention to provide, for a drag chain conveyor having the aforementioned general features, a suitable connection of the plastic carriers with the metallic conveyor chains.

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The realization of this object, including advantageous embodiments and further developments of the invention, is derived from the contents of the patent claims that follow this description.

The basic concept of the invention is that the connection of the plastic carriers with the conveyor chain is effected via a molding around of corresponding, annular chain links of the conveyor chain, whereby the plastic, which is molded for the simultaneous production of the plastic carriers monolithically with the connecting regions that hold the chain links, penetrates and surrounds the chain links of the conveyor chain. This has the advantage that the plastic carriers and their connection with the chain links is produced in a single operation. The molding around of the chain links has the advantage that in the critical cross-sectional region, namely at the connection location between chain link and carrier, a massive increase of the cross-sectional region occurs, whereby the carrier geometry, in individual cases, is to be designed such that the critical weak point areas receive a maximum cross-sectional area.

Pursuant to one embodiment of the invention, the conveyor chain can be composed of individual, interconnected chain strands having plastic carriers molded thereon. Since the connection between the plastic

carriers and the individual chain links is to occur by molding of a plastic matrix, in particular not underground on location, care is taken that chain strands, with plastic carriers molded thereon, are designed in optimum lengths. The length depends, in individual cases, upon the application and also upon the transport possibilities. For example, chain strands of varying length are provided as standard strands, adapter strands, repair strands, etc.

The design of the plastic carriers and their connection is a function, in individual cases, of the design of the conveyor chains having carriers as a chain unit; for example, it can be provided pursuant to specific embodiments of the invention that the carriers be disposed between two outwardly disposed individual chains, alternatively on a centrally extending chain, or in a further alternative on two spaced apart, centrally extending chains, whereby in the last case a so-called double central chain is formed.

Pursuant to one embodiment of the invention, for the manufacture of the plastic carriers, including their connection regions with the chain links, a plastic material that is able to flow, and that has self-extinguishing, difficult to ignite, and anti-static material properties, is used. For example, a polyamide casting plastic can be used for

producing the plastic carriers. Furthermore, from thermoplastics, a polyamide PEI/PAI or a polyether ketone PEEK can be used. A conceivable matrix from duroplastics can be an epoxy matrix, a polyester matrix, or a phenol matrix.

Pursuant to an embodiment of the invention, metallic reinforcing particles are cast into the plastic carriers.

However, in particular it can be provided that for reinforcement of the plastic carriers, reinforcing fibers are introduced into the plastic material.

In this connection, pursuant to a first alternative, short reinforcing fibers having a random distribution are embedded into the plastic matrix. Alternatively, reinforcing fibers that extend over the length of the plastic carriers can be introduced into the plastic matrix, whereby the reinforcing fibers can alternatively be disposed so as to extend about the chain links, or so as to be passed through the chain links.

For the reinforcement of the plastic matrix, mesh, fabric, braiding or knitting of reinforcing fibers can be introduced. Carbon fibers, aramid fibers, or even glass fibers can, for example, be used.

Embodiments of the invention are shown in the drawing, whereby the illustrations are respectively limited to the showing of an individual plastic carrier with its connection to the chain links of a so-called double central chain having two parallel and spaced-apart central chains. The drawing shows:

Fig. 1 a carrier with chain connection and short reinforcing fibers introduced in a random distribution,

Fig. 2 a plastic carrier pursuant to Figure 1 having reinforcing fibers extending over the length of the plastic carrier,

Fig. 3 another embodiment of the plastic carrier pursuant to Figure 2,

Fig. 4 a further embodiment of the plastic carrier of Figure 2,

Fig. 5 the plastic carrier having a mesh of reinforcing fibers introduced.

The construction of a drag chain conveyor having the aforementioned features can be derived in detail from WO 01/81211 A1, which is mentioned as the closest state of the art, so that reference is made thereto. As can be seen from Figure 1, the connection of a plastic carrier 10 with the annular chain links 13 of the two central chains 11

and 12 is formed in that during the casting or molding around of the chain links 13, the plastic or synthetic material matrix penetrates and surrounds the chain links 13 of the two central chains 11 and 12. For the reinforcement of the plastic matrix, reinforcing fibers 14 having a short length are randomly distributed in the plastic carrier.

In the embodiment illustrated in Figure 2, introduced into the plastic matrix of the plastic carrier 10 are reinforcing fibers 15 having such a length that the reinforcing fibers 15 extend over the length of the plastic carriers 10. In so doing, the reinforcing fibers 15 surround the chain links 13 of the two central chains 11 and 12, which chain links are embedded in the plastic matrix.

In the embodiment illustrated in Figure 3, the reinforcing fibers 15 are passed between the chain links 13 of the two central chains 11 and 12 in such a way that the reinforcing fibers 15 cross in the region between the two central chains 11 and 12.

Figure 4 shows a further alternative arrangement of the course of the reinforcing fibers 15, according to which the reinforcing fibers also extend through the openings of the annular chain links 13 and thus at

least partially also interconnect the chain links 13 of the two central chains 11 and 12.

Finally, in the embodiment illustrated in Figure 5, a mesh 16 of reinforcing fibers is provided that can also be embodied as fabric, braiding or knitting.

The features of the subject matter disclosed in the preceding description, the patent claims, the abstract and the drawing can be important individually as well as in any desired combination with one another for realizing the various embodiments of the invention.